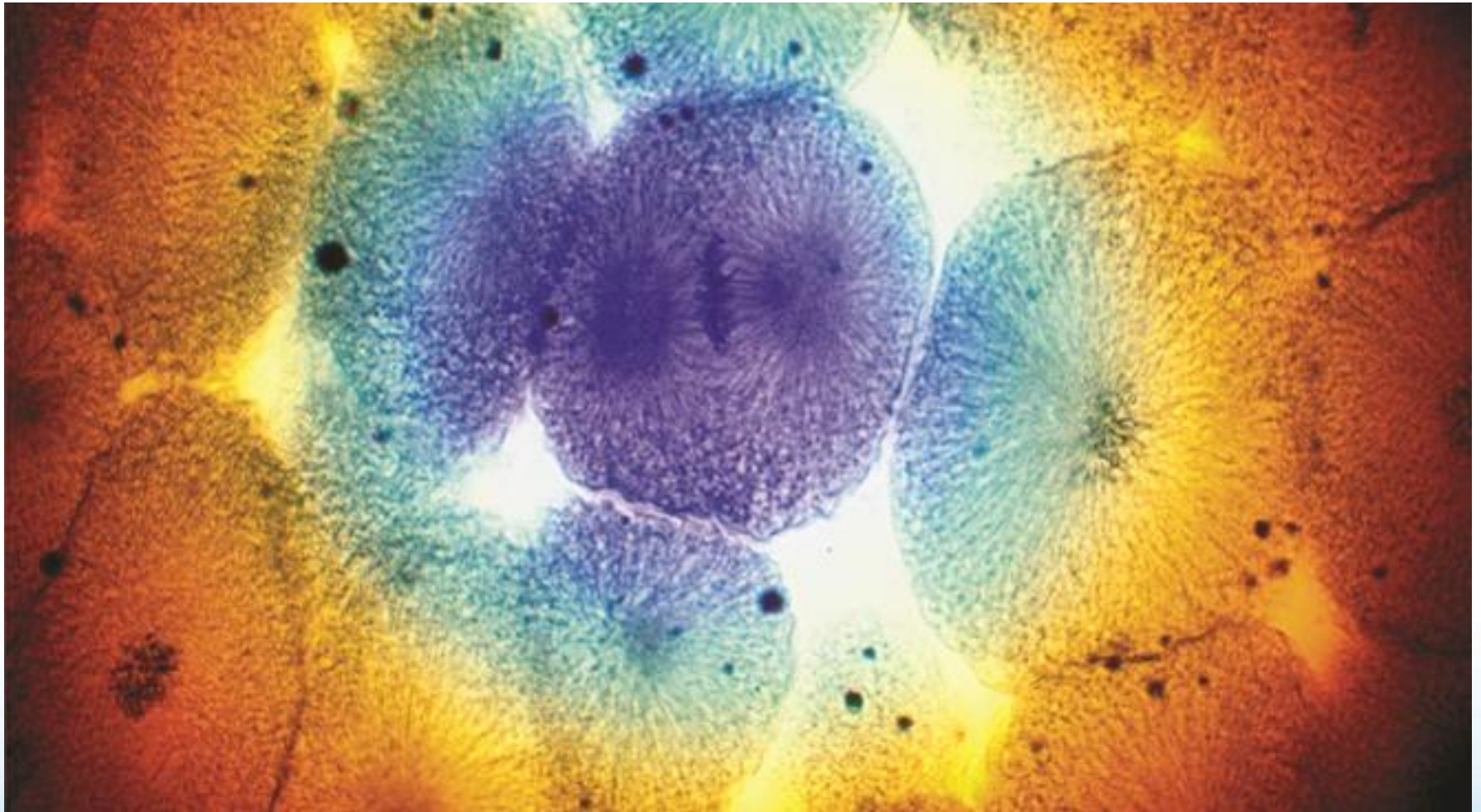


Regulating the Cell Cycle



Learning Objectives

- Describe how the cell cycle is regulated.
- Explain how cancer cells are different from other cells.

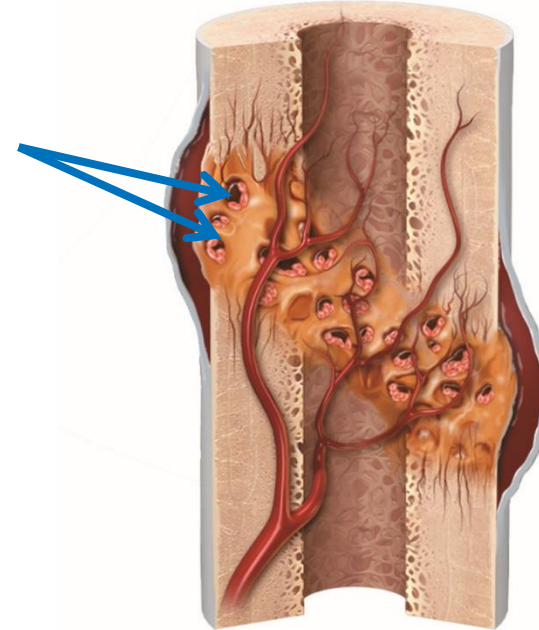
Cell Division and Repair



Healing a Bone



new bone cells



- Cells at the edge of an injury are stimulated to divide rapidly.
- As an injury heals, the rate of cell division slows.

The Discovery of Cyclins

- Scientists found a protein in a cell undergoing mitosis.
- They injected the protein into a non-dividing cell.
- A mitotic spindle started to form.
- **Cyclins:** proteins that regulate the cell cycle

Regulatory Proteins

Internal regulators:

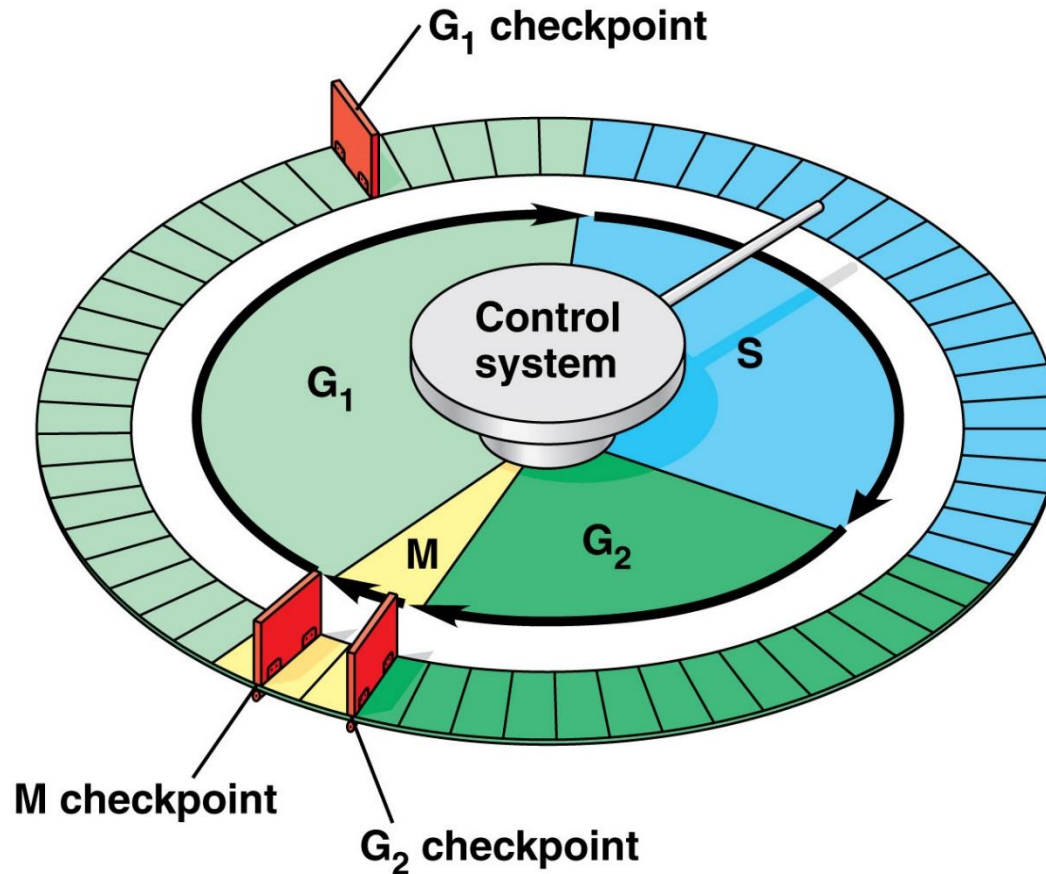
- respond to events inside the cell
- let cell cycle proceed only when certain steps have already happened
- G1, G2, and M Checkpoints

External regulators:

- respond to events outside the cell
- direct cells to speed up or slow down the cell cycle
- **growth factors:** wound healing and embryonic development
 - Tells near by cells to grow and divide

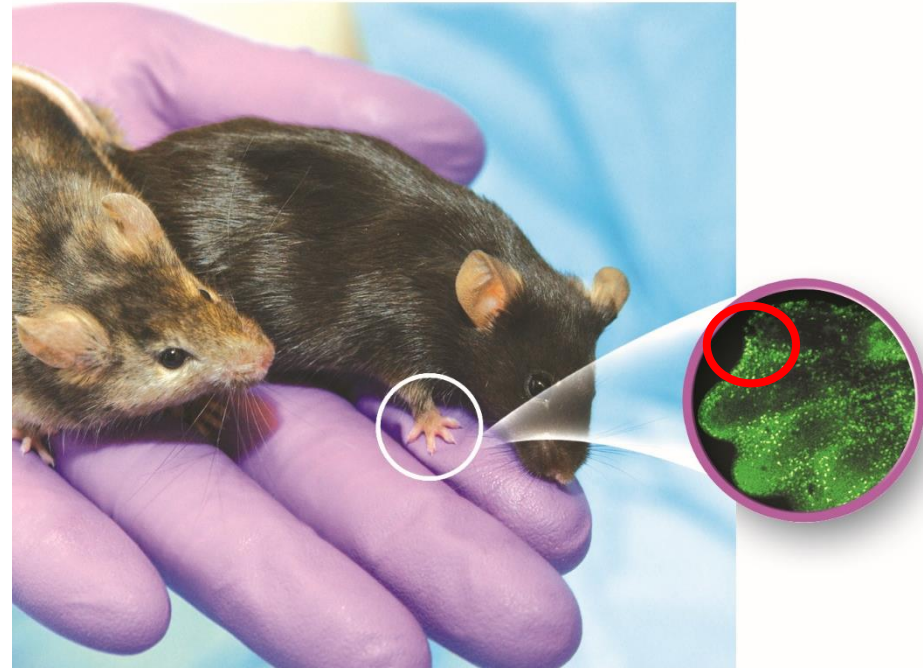


Cell Cycle Control System



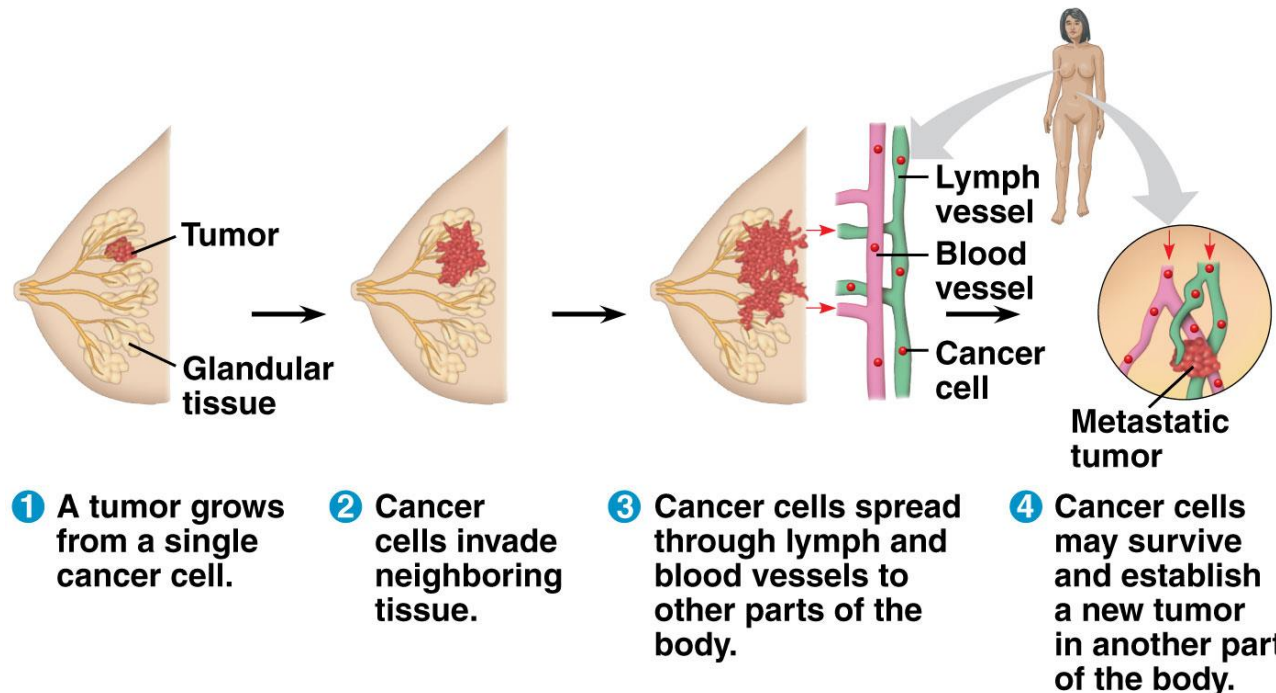
Apoptosis

- A process of programmed cell death
- Important role in structuring tissues during growth and development
- Cell undergoes a series of controlled steps for self-destruction.
- Occurs when cell can't pass checkpoints



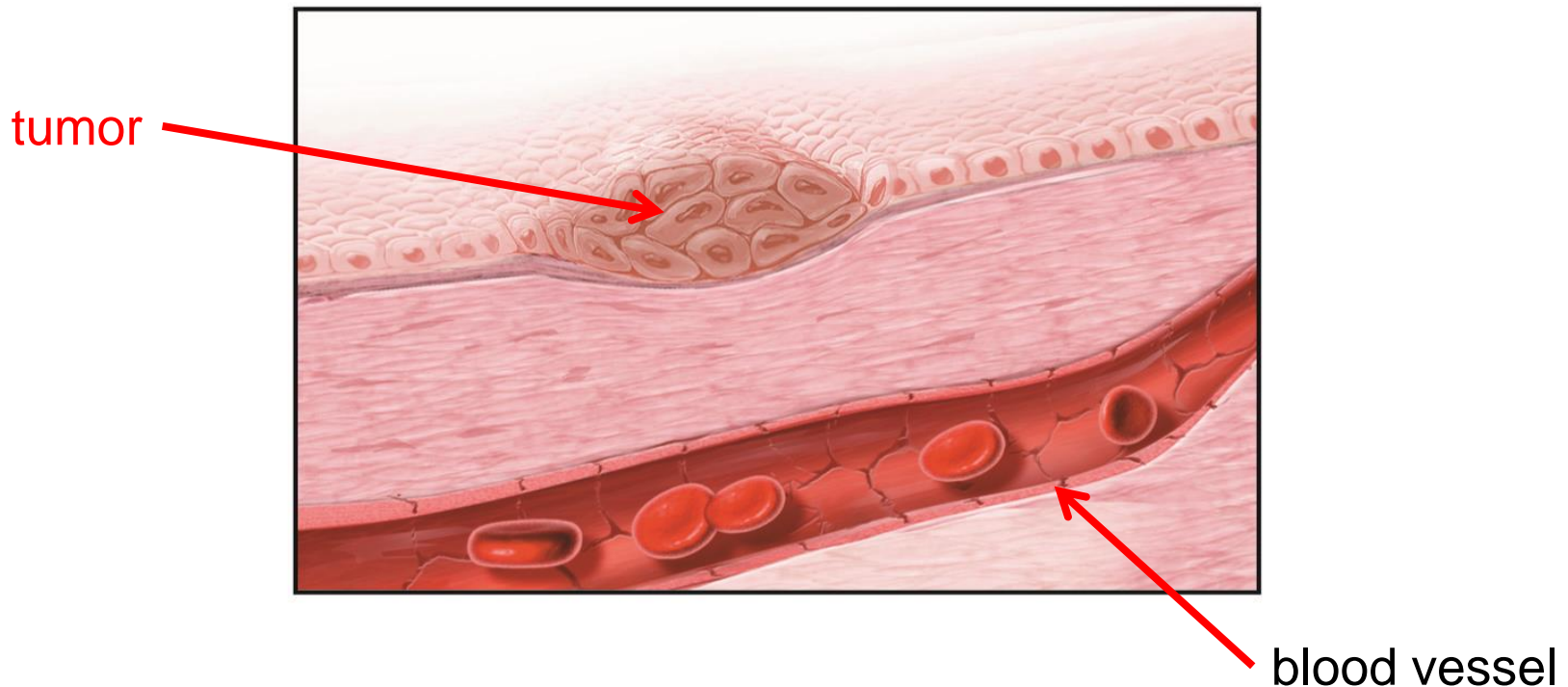
Tumors = mass of abnormal cells

- **Benign tumor**: lump of cells remain at original site
- **Malignant tumor**: invasive - impairs functions of 1+ organs (called cancer)
- **Metastasis**: cells separate from tumor and travel to other parts of body

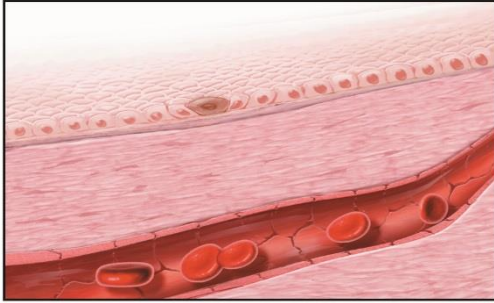


Cancer: Uncontrolled Cell Growth

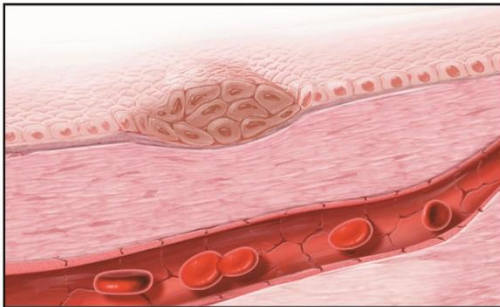
- Cancer cells don't respond to normal regulatory signals.
- Cell cycle is disrupted.
- Cells grow and divide uncontrollably.



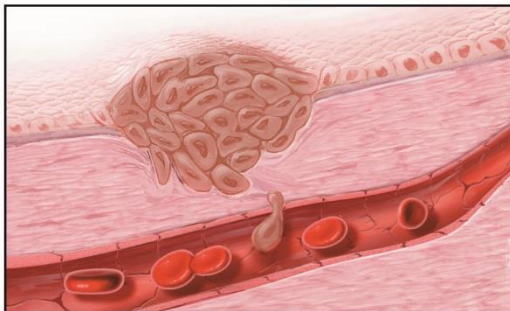
Cancer Formation: A Closer Look



1. A cell begins to divide abnormally.



2. Cells produce a tumor and start to displace normal cells and tissues.



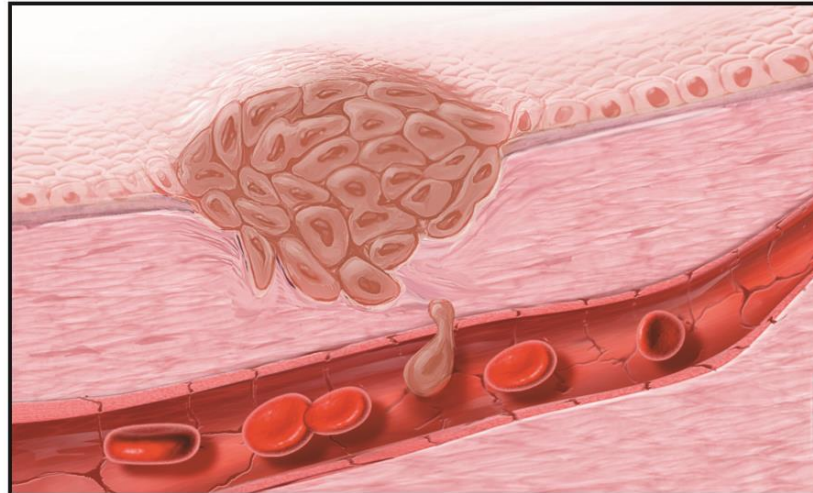
3. Cancer cells move to other parts of the body.

What Causes Cancer?

In all cancers, control over the cell cycle has broken down.

Cancer results from a **defect in genes** that control cell growth and division.

defect caused by genetics or environment



Treatments for Cancer

- Surgery to remove localized tumor
- Radiation to destroy cancer cell DNA
- Chemotherapy to kill cancer cells or slow their growth

